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Attorney's Docket No. 9103.38

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re: Hamilton et al.
Serial No.: 09/936,387
Filed: December 18, 2001
For: *MAXIMUM / MINIMUM THERMOMETER*

Confirmation No.: 2937
Group Art Unit: 2859
Examiner: Gail Kaplan Verbitsky

Date: May 2, 2005

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**TRANSMITTAL OF APPEAL BRIEF
(PATENT APPLICATION--37 C.F.R. § 41.37)**

1. Transmitted herewith is the APPEAL BRIEF for the above-identified application, pursuant to the Notice of Appeal filed on March 3, 2005.
2. This application is filed on behalf of
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3. Pursuant to 37 C.F.R. § 41.20(b)(2), the fee for filing the Appeal Brief is:

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Respectfully submitted,

F. Michael Sajovec
Registration No. 31,793

Myers Bigel Sibley & Sajovec, P.A.
P. O. Box 37428
Raleigh, North Carolina 27627
Telephone: (919) 854-1400
Facsimile: (919) 854-1401
Customer No. 20792

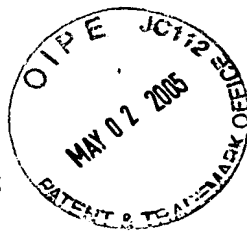
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Betty-Lou Rosser, CP
Certified Paralegal

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APPELLANT'S BRIEF ON APPEAL UNDER 37 C.F.R. § 1.192

Sir:

This Appeal Brief is filed pursuant to the "Notice of Appeal to the Board of Patent Appeals and Interferences" filed on March 3, 2005.

REAL PARTY IN INTEREST

The real party in interest is S. Brannan and Sons Ltd. of Cumbria, United Kingdom, the assignee of this application.

RELATED APPEALS AND INTERFERENCES

Appellants are aware of no appeals or interferences that would be affected by the present appeal.

STATUS OF CLAIMS

As of the filing date of this Appeal Brief, Claims 1-8 and 10-21 are pending and stand rejected under 35 U.S.C. § 103(a). Appellants appeal the final rejection of these claims. **Appendix A** presents the claims at issue as finally rejected in the Final Office Action dated November 2, 2004 ("Final Action").

STATUS OF AMENDMENTS

All amendments made by Appellant during prosecution have been entered as indicated in the Advisory Action dated February 16, 2005.

CONCISE SUMMARY OF THE INVENTION

Appellants have invented a maximum/minimum thermometer that obviates the need for the use of mercury as a transfer liquid. Mercury, while possessing properties desirable for a transfer fluid, is expensive and highly toxic. Suitable alternatives must be immiscible with the transfer liquid, remain substantially in a mobile liquid state at and between the upper and lower temperature limits of the thermometer in use, and have a density that is different from that of the expansion liquid. Appellants have therefore created a maximum/minimum thermometer wherein the transfer liquid is a mercury free solution comprising compounds selected from the group consisting of inorganic compounds, organometallic compounds, organic liquids, and ionic liquids.

ISSUES

Whether Claims 1-7 and 12-19 are rejected under 35 U.S.C. § 103(a) as being obvious over U.S. Patent No. 2,102,678 to Campbell ("Campbell") and U.S. Patent No. 5,215,378 to Manske ("Manske") for reasons presented in the Final Action. Whether Claim 8 is rejected under 35 U.S.C. § 103(a) as being obvious over Campbell and Manske, in further view of U.S. Patent No. 5,990,199 to Bealing et al. ("Bealing") for the reasons presented in the Final Action. Whether Claim 20 is rejected under 35 U.S.C. § 103(a) as being obvious over Campbell and Manske, in further view of GB0001967/GB041882 ("GB") for the reasons presented in the Final Action. Whether Claims 10-11 are rejected under 35 U.S.C. § 103(a) as being obvious over Campbell and Manske, in further view of U.S. Patent No. 1,942,857 to Hickman ("Hickman") for the reasons presented in the Final Action. Whether Claim 21 is rejected under 35 U.S.C. § 103(a) as being obvious over Campbell and Manske, in further view of U.S. Patent No. 4,908,503 to Bernard ("Bernard") for the reasons presented in the Final Action.

GROUPING OF CLAIMS

For the purposes of this Appeal, with respect to the § 103(a) rejections, Claims 1-7 and 12-19 stand or fall together and Claims 10-11 stand or fall together. Claims 8, 20, and 21 each stands or falls alone.

ARGUMENT

I. Legal Standard of Obviousness

A determination under § 103 that an invention would have been obvious to someone of ordinary skill in the art is a conclusion of law based on fact. *Panduit Corp. v. Dennison Mfg. Co.*, 810 F.2d 1593, 1 U.S.P.Q.2d 1593 (Fed. Cir. 1987), *cert. denied*, 107 S.Ct. 2187. After the involved facts are determined, the decision maker must then make the legal determination of whether the claimed invention as a whole would have been obvious to a person having ordinary skill in the art at the time the invention was made. *Id.* at 1596. The United States Patent and Trademark Office ("USPTO") has the initial burden under § 103 to establish a *prima facie* case of obviousness. *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988).

To establish a *prima facie* case of obviousness, the USPTO must satisfy three requirements. First, the prior art reference or combination of references must teach or suggest all of the limitations of the claims. *See In re Wilson* 424 F.2d 1382, 1385, 165 U.S.P.Q. 494, 496 (CCPA 1970) ("All words in a claim must be considered in judging the patentability of that claim against the prior art"). Importantly, the teachings must come from the prior art, not from the Appellant's disclosure. *See In re Vaeck*, 947 F.2d 488, 493, 20 U.S.P.Q.2d 1438, 1442 (Fed. Cir. 1991). Second, the prior art relied upon, coupled with the knowledge generally available in the art at the time of the invention, must contain some suggestion or incentive that would have motivated the skilled artisan to modify a reference or to combine references. *In re Oetiker*, 24 U.S.P.Q.2d 1443, 1446 (Fed. Cir. 1992); *In re Fine*, 837 F.2d at 1074; *In re Skinner*, 2 U.S.P.Q.2d 1788, 1790 (Bd. Pat. App. & Int. 1986). Third, the proposed modification or combination of the prior art must have a reasonable expectation of success, determined from the vantage point of the skilled artisan at the time the invention was made. *See Amgen, Inc. v. Chugai Pharm. Co.*, 927 F.2d 1200, 1209, 18 U.S.P.Q.2d 1016, 1023 (Fed. Cir. 1991).

As discussed above, the prior art reference or references when combined must teach or suggest *all* the recitations of the claims, and there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. M.P.E.P. §2143. The mere fact that references can be combined or modified does not render the resultant

combination obvious unless the prior art also suggests the desirability of the combination. M.P.E.P. §2143.01, citing *In re Mills*, 916 F.2d 680, 16 U.S.P.Q.2d 1430 (Fed. Cir. 1990). As emphasized by the Court of Appeals for the Federal Circuit, to support combining references, evidence of a suggestion, teaching, or motivation to combine must be **clear and particular**, and this requirement for clear and particular evidence is not met by broad and conclusory statements about the teachings of references. *In re Dembiczak*, 50 U.S.P.Q.2d 1614, 1617 (Fed. Cir. 1999). In an even more recent decision, the Court of Appeals for the Federal Circuit has stated that, to support combining or modifying references, there must be **particular** evidence from the prior art as to the reason the skilled artisan, with no knowledge of the claimed invention, would have selected these components for combination in the manner claimed. *In re Kotzab*, 55 U.S.P.Q.2d 1313, 1317 (Fed. Cir. 2000).

II. The Rejections

In the Final Office Action dated November 2, 2004 (the Final Action), Claims 1-7 and 12-19 were rejected as obvious under 35 U.S.C. §103(a) over Campbell and Manske. Claim 8 was rejected as obvious under 35 U.S.C. §103(a) over Campbell and Manske in further view of Bealing. Claims 10-11 were rejected as obvious under 35 U.S.C. §103(a) over Campbell and Manske in further view of Hickman. Claim 20 is rejected as obvious under 35 U.S.C. §103(a) over Campbell and Manske in further view of GB. Claim 21 is rejected as obvious under 35 U.S.C. §103(a) over Campbell and Manske in further view of Bernard.

III. The Rejection of Claims 1-7 and 12-19

Claim 1 recites a reusable maximum/minimum thermometer comprising an expansion liquid, which expands or contracts in response to changes in temperature, a transfer liquid which is moved in response to the expansion or contraction of the expansion liquid and which is substantially immiscible with the expansion liquid, two indexes, and a temperature scale associated with the maximum/minimum thermometer, wherein the indexes are moved by the transfer liquid into resting positions where the maximum and minimum temperatures are read off the temperature scale, and wherein the transfer liquid is a mercury free solution selected from the group consisting of inorganic compounds, organometallic compounds, organic liquids, and ionic liquids. Claims 2-7 and 12-19 are dependent claims that further describe the densities of the transfer liquid, the temperature range of the thermometer, the properties of

the transfer liquid, dyeing of the transfer liquid, and the compositions of the transfer or expansion liquids.

The Final Action asserts that Campbell discloses a maximum/minimum thermometer comprising an expansion liquid which expands and contracts in response to a temperature change, and which moves the transfer liquid and two indicating means made of a magnetizable material along the tube. The Final Action admits that Campbell not only does not teach that the transfer liquid is mercury free and but also does not teach any particular aqueous solution for the transfer liquid. The Final Action asserts that Manske discloses a thermometer indicator comprising a hollow tube, a colorless organic expansion liquid that undergoes volume change as the result of temperature change. The Final Action further asserts that when the expansion liquid constricts, it draws a transfer liquid, which is not mercury and is immiscible with the expansion liquid. The Examiner maintains that the transfer liquid is an aqueous salt solution and that is capable of being dyed.

The Final Action asserts that it would have been obvious to one of ordinary skill in the art at the time of the invention to replace the transfer liquid in the thermometer disclosed by Campbell, with the transfer liquid, as taught by Manske, because both of them are alternative types of transfer liquids, which will perform the same function, of moving in response to volume change of the expansion liquid and indicating temperature, if one is replaced with the other.

The Final Action further asserts that the temperature range in Claim 5 is only considered to be an optimal temperature range that a person of ordinary skill would be able to determine using routine experimentation. In addition, the Final Action maintains that the density of the transfer liquid relative to the expansion liquid, absent any criticality, is only considered to be "optimum," and one of ordinary skill in the art would have been able to determine this by routine experimentation. Further, the particular material for the expansion liquid (Claim 18) or the transfer liquid (Claims 12-17), absent any criticality, are also considered optimum properties and thus routine for one of ordinary skill in the art.

A. Claims 1-7 and 12-19 Are Not Rendered Obvious by Campbell and Manske

1. Campbell

Campbell merely describes a typical maximum/minimum thermometer, and as the Final Action admits, it is not mercury free, or directed in any manner toward the replacement of the transfer liquid. In fact, the purpose of Campbell is to create a tamper-resistant thermometer so that one cannot alter the thermometer's reading by physical manipulation. The Final Action asserts that Campbell does not rule out the use of a mercury-free liquid. However, if Campbell is read without the benefit of the instant specification, it only teaches a mercurious transfer liquid, and since it performs its function perfectly well, the skilled person would not consider that a mercury-free transfer liquid could or should be used. The only way such artisan could reach the conclusion of changing the fluid is using hindsight in view of Appellants' application. Such is clearly not permitted.

2. Manske

Appellants submit that Manske is *not* a thermometer, but a temperature indicator. It does not measure the maximum or minimum temperature, but merely becomes colored when a pre-determined temperature is reached. The temperature might be greater or lower than the defined points, but the indicator will not measure what the temperature ranges are -- it merely indicates that a particular temperature has been reached. Further, Manske does not disclose a transfer liquid, but a "separating substance." As described in the instant specification, a transfer liquid must have a different density than the expansion liquid (Specification, page 4, lines 19-20). The difference in density between the transfer liquid and the expansion liquid is critical for the indexes to remain positioned at the interface of the liquids and to reliably indicate temperature. In Manske, a density differential is not deemed to be a requirement or even advantageous for the separating substance, moreover, there are not indexes so there is no reason in Manske for the density differential.

It is especially noteworthy that nowhere in Manske is mercury, the most common transfer liquid, identified as a separating substance. Further, the separating substances are never deemed or referred to as replacements for mercury, nor is environmental friendliness referred to as a goal of the invention. This is because the separating substance is clearly *not* a transfer liquid. It is merely a "plug" separating the colored organic liquid from the non-colored liquid, and may be a variety of substances, including Teflon and even wood.

3. The Combination of Campbell and Manske

In order for the combination of Campbell and Manske to render the instant claims obvious, together they must both teach all the limitations of the claims and contain some suggestion or incentive to combine the references. Neither Campbell nor Manske discloses a transfer liquid that is mercury free. As described above, Campbell does not disclose the composition of the transfer liquid, but merely states that the indexes float on the surface of the thermometric indicating liquid. Manske does not describe a transfer liquid for the reasons described above. Further, there is no suggestion or motivation to combine the two references. Manske does not disclose the use of mercury. Campbell does not disclose the desirability of replacing mercury. Further, Manske does not even contemplate mercury as a possible separating substance. Therefore, one of skill in the art would not be motivated to combine the references. Appellants submit that the Examiner is using impermissible hindsight, combined with information disclosed in the instant specification, to reach the instant claims from the disclosures of Campbell and Manske.

Appellants also submit the Final Action's assertion that temperature range, density, and the specific materials are all "optimal" parameters is also unfounded. The MPEP §2144.05 states that "[w]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation," citing *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). In Claims 2-7 and 12-19, the general conditions of the claim are *not* disclosed in the prior art. As discussed above, Manske and Campbell do not alone or together create the general conditions of the claim. Therefore, the specific temperatures, densities or materials used cannot be said to be optimizable parameters.

IV. The Rejection of Claim 8

Claim 8 describes the maximum/minimum thermometer of Claim 1, wherein the transfer liquid further displays a low thermal expansivity, a low toxicity, and/or is capable of being colored by a suitable dye, wherein the dye is selected from Aniline Blue, Eurocert Green S or water soluble salts of inorganic complex ions such as copper (II) (tetra-ammoniato) ion or the hexacyanato ferrate ion.

The Final Action asserts that Campbell and Manske disclose the device except for the fact that they do not teach a particular dye, such as Aniline Blue. The Final Action cites Bealing for its disclosure that Aniline Blue is used as a dye to achieve a stable color.

A. Claim 8 Is Not Rendered Obvious by Campbell and Manske in View of Bealing

1. Bealing

Bealing discloses indicator ink compositions that may comprise Aniline Blue. The ink compositions elicit a detectable change when exposed to certain environmental conditions.

2. The Combination of Campbell and Manske in View of Bealing

For the reasons described above, Campbell and Manske do not render the maximum/minimum thermometer of Claim 8 obvious. Further, Bealing does not remedy these deficiencies. Bealing merely discloses an ink composition that may include Aniline Blue. Further, the ink compositions under go detectable changes under certain conditions, and thus are not even related to the purposes of the colorant in Claim 8. However, even if one is to cite Bealing for the proposition that Aniline Blue is a known dye, as discussed above, Campbell and Manske do not together disclose the transfer fluid to which the dye is added. Therefore, Campbell and Manske in view of Bealing do not render Claim 8 obvious.

V. The Rejection of Claim 10 and 11

Claims 10-11 recite the maximum/minimum thermometer of Claim 1, wherein the transfer liquid is a solution comprising an inorganic or organometallic compound of elements found in groups III, IV, V, VI and VII of the periodic table, or mixtures thereof (Claim 10) and further wherein the inorganic compound is a halogen-containing compound (Claim 11).

The Final Action asserts that Hickman discloses a transfer liquid that comprises a halogenated hydrocarbon in diethylene glycol. Therefore, the Final Action maintains that it would be obvious to one of ordinary skill in the art at the time of the invention to make a transfer liquid disclosed by Campbell and Manske that comprises a halogenated hydrocarbon, because halogenated hydrocarbons are good lubricants, insoluble in the expansion liquid, and will allow the transfer liquid to move along the tube.

A. Claims 10-11 Are Not Rendered Obvious by Campbell and Manske in view of Hickman

1. Hickman

Hickman discloses a measuring instrument whereby mercury is "superimposed" with a liquid, which will neutralize the retarding effect of the impurities in the mercury during its movement within the thermometer (Hickman, Claim 1). The lubricant may include mixtures comprising halogenated hydrocarbons.

2. The Combination of Campbell and Manske in View of Hickman

For the reasons described above, Campbell and Manske do not render the maximum/minimum thermometer of Claims 10-11 obvious. Further, Hickman does not remedy these deficiencies. Hickman merely describes an additive added to mercury that neutralizes the retarding effects of mercury impurities. There is no transfer liquid disclosed, and the specification even describes that the additive should not "creep in quantity below the mercury surface." Hickman, col. 2, lines 45-46. Thus, the additive is not meant to act as a transfer liquid, but to coat the glass to allow the mercury to move more easily. Further, as the invention of Hickman is necessitated by the use of mercury, Claims 10-11 relate to mercury-free transfer liquids and thus Hickman has no relevance. Thus, the combination of Campbell and Manske in view of Hickman does not render Claims 10 and 11 obvious.

VI. The Claim 20 Rejection

Claim 20 recites the maximum/minimum thermometer of Claim 1, wherein the indexes have a density less than that of the transfer liquid, are able to float at the surface of the transfer liquid, and are in the form of a tube into which has been inserted into a piece of ferrous wire.

The Final Action asserts that Campbell and Manske together disclose all the limitations of the claim, but do not disclose indexes in the form of a tube into which a ferrous wire has been inserted. The Final Action asserts that GB discloses indexes within glass tubes, so that one of ordinary skill in the art at the time of the invention would have found it obvious to use the glass tubes of GB, so as to protect the indexes from possible corrosion when in direct contact with the transfer or expansion liquid.

A. Claim 20 Is Not Rendered Obvious by Campbell and Manske in View of GB.

1. GB

GB discloses a maximum/minimum thermometer having steel indexes fused into small glass tubes. It does not disclose the use of ferrous wire in the glass tubes.

2. The Combination of Campbell and Manske in View of GB

For the reasons described above, the combination of Campbell and Manske does not render Claim 20 obvious. Further, GB does nothing to remedy these deficiencies. In fact, GB does not even disclose the use of a ferrous wire within a glass tube, but instead discloses steel indexes enclosed within glass tubes. However, even if GB were to disclose the use of ferrous wire in glass tubes, Claim 20 would still not be obvious over Campbell and Manske in view of GB. As discussed above, none of Campbell, Manske and GB disclose mercury free transfer liquids, nor provide any suggestion to combine the references to make mercury-free transfer liquids. Therefore, the combination of the references does not render Claim 20 obvious.

VII. The Claim 21 Rejection

Claim 20 recites the maximum/minimum thermometer of Claim 1 wherein the indexes have a density less than that of the transfer liquid, are able to float at the surface of the transfer liquid, and are constructed from a plastic material into which has been mixed and/or melted a quantity of magnetic powder such as iron filings, magnetite (Fe_3O_4), strontium ferrite, or other magnetic powders.

The Final Action asserts that Campbell and Manske disclose the device of Claim 20, except for the particular material of the indexes. The Final Action cites Bernard as having a marking plate/index made of plastic with a magnetic powder injected. Therefore, the Final Action finds that one of ordinary skill in the art would have found it obvious to combine Campbell and Manske to make the indexes in the manner taught by Bernard.

A. Claim 21 Is Not Rendered Obvious by Campbell and Manske In View of Bernard

1. Bernard

Bernard discloses a device for identifying pieces of timber. Ostensibly, Bernard is cited for the disclosure that magnetic powder may be mixed and/or melted into plastic material.

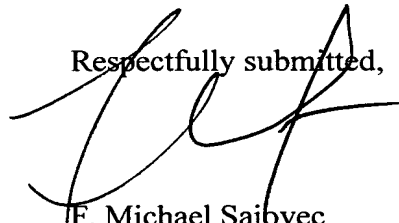
2. The Combination of Campbell and Manske in view of Bernard

For the reasons described above, Campbell and Manske do not render the maximum/minimum thermometer of Claim 21 obvious. Further, Bernard does not remedy these deficiencies. Bernard does not relate to measuring devices of any kind, but instead relates to marking plates for timber. There is no disclosure that describes any use beside for marking plates for timber, and there is no suggestion within Bernard to combine it with Campbell or Manske. Further, there is no reason that one of skill in the art at the time of the invention would be aware of timber marking plates, or have any knowledge of Bernard. Therefore, the combination of Campbell and Manske in view of Bernard does not render Claim 21 obvious.

CONCLUSION

In light of the entire record and the above discussion, Appellants respectfully submit that claims 1-8 and 10-21 are patentable over the cited references. Accordingly, Appellant respectfully requests reversal of the rejection of claims 1-8 and 10-21 and that this case be passed to issuance.

Respectfully submitted,



F. Michael Sajovec
Registration No. 31,793

USPTO Customer No. 20792
Myers Bigel Sibley & Sajovec, P.A.
P. O. Box 37428
Raleigh, North Carolina 27627
Telephone: (919) 854-1400
Facsimile: (919) 854-1401

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Betty-Lou Rosser, CP
Certified Paralegal

APPENDIX A

What is Claimed is:

1. (Previously Presented) A reusable maximum/minimum thermometer comprising an expansion liquid (42) which expands or contracts in response to changes in temperature, a transfer liquid (48) which is moved in response to the expansion or contraction of the expansion liquid and which is substantially immiscible with the expansion liquid, two indexes (44, 51), and a temperature scale associated with the maximum/minimum thermometer, wherein the indexes are moved by the transfer liquid into resting positions where maximum and minimum temperatures are read off the temperature scale, and wherein the transfer liquid is a mercury free solution selected from the group consisting of inorganic compounds, organometallic compounds, organic liquids, and ionic liquids.

2. (Original) The maximum/minimum thermometer according to claim 1 wherein the transfer liquid has a density which is different from that of the expansion liquid.

3. (Original) The maximum/minimum thermometer according to claim 2 wherein the transfer liquid has a density greater than that of the expansion liquid.

4. (Original) The maximum/minimum thermometer according to claim 3 wherein the transfer liquid has a density greater than 0.87 g. cm^{-3} .

5. (Previously Presented) The maximum/minimum thermometer according to claim 1 wherein the transfer liquid remains substantially liquid at least between -30°C and $+50^{\circ}\text{C}$.

6. (Previously Presented) The maximum/minimum thermometer according to claim 1 wherein the transfer liquid further displays a low thermal expansivity; a low toxicity; and/or is coloured or capable of being coloured.

7. (Original) The maximum/minimum thermometer according to claim 6 wherein the transfer liquid is capable of being coloured by a suitable dye.

8. (Previously Presented) The maximum/minimum thermometer according to claim 7 wherein the dye is selected from Aniline Blue, Eurocert Green S or water soluble salts of inorganic complex ions such as the tetra-ammino copper (II) ion or the hexacyanato ferrate ion.

9. (Cancelled)

10. (Previously Presented) The maximum/minimum thermometer according to claim 1 wherein the transfer liquid is a solution comprising inorganic or organometallic compounds of elements found in groups III, IV, V, VI and VII of the periodic table, or mixtures thereof.

11. (Original) The maximum/minimum thermometer according to claim 10 wherein the compounds are halogen containing compounds.

12. (Previously Presented) The maximum/minimum thermometer according to claim 1 wherein the transfer liquid is a solution comprising ionic compounds.

13. (Original) The maximum/minimum thermometer according to claim 12 wherein the transfer liquid is a solution comprising at least one alkaline earth and/or alkali metal salt.

14. (Original) The maximum/minimum thermometer according to claim 13 wherein the solution is an aqueous solution in which said at least one alkaline earth and/or alkali metal salt is dissolved.

15. (Original) The maximum/minimum thermometer according to claim 14 wherein the aqueous solution comprises an amount of alkaline earth and/or alkali metal salt from between 80% and 400% w/v.

16. (Original) The maximum/minimum thermometer according to claim 15 wherein the alkaline earth or alkali metal salt is selected from halides, sulphates, hydroxides,

carbonates, chlorates, dichromates, chromates, carboxylates, nitrates, nitrites, phosphates, ammonium compounds or other salts comprising an alkaline earth or alkali metal ion and a cationic species.

17. (Original) The maximum/minimum thermometer according to claim 16 wherein the alkali earth or alkali metal salt is selected from CaI_2 , CaBr_2 , CsBr , CsF , CsOH , Cs_2SO_4 , CH_3COOCs , $\text{KF} \cdot 2\text{H}_2\text{O}$, HCOOK , KI , KNO_2 , RbF , $\text{NaClO}_4 \cdot \text{H}_2\text{O}$, $\text{Na}_2\text{Cr}_2\text{O}_7 \cdot 2\text{H}_2\text{O}$ and $\text{NaI} \cdot 2\text{H}_2\text{O}$.

18. (Previously Presented) The maximum/minimum thermometer according to claim 1 wherein the expansion liquid comprises a hydrocarbon or mixtures of hydrocarbon.

19. (Previously Presented) The maximum/minimum thermometer according to claim 1 wherein the indexes have a density less than that of the transfer liquid and are able to float at the surface of the transfer liquid.

20. (Original) The maximum/minimum thermometer according to claim 19 wherein the indexes are in the form of a tube into which has been inserted a piece of ferrous wire.

21. (Previously Presented) The maximum/minimum thermometer according to claim 19 wherein the indexes are constructed from a plastic material into which has been mixed and/or melted a quantity of magnetic powder such as iron filings, magnetite (Fe_3O_4), and/or strontium ferrite.

22. (Cancelled)